

Introduction to Artificial Intelligence

ID.2401

Person in charge: Maria Trocan

Prerequisites: IF.1103 (Introduction to data science techniques), II.1102 (Algorithmic and programming)

Organisation: Class– Labs – Project (42hrs + 80hrs individual work)

Assessment : Exam / Project defense

ECTS: 5 credits

Overview

Artificial intelligence is mainly interested in solving problems, usually complex, using general knowledge on the field. Two important questions are at the heart of this activity: How to formalize this general knowledge? How to design systems capable of automatically exploiting them to solve the problems that interest us.

This course presents different possible approaches. In particular, it focuses on state-space-based resolution techniques, heuristic algorithms, and game algorithms, which, on the whole, lead to solving problems. It also presents the problem of knowledge-based systems, where the formalization of knowledge is carried out in a more "logical" framework and where problem solving is similar to the construction of reasoning, exploiting this logical knowledge, at the same time. help of inference systems.

Learning Objectives

Skills

This module covers the applications of artificial intelligence to problem solving. The students will master the methods of problem formalization and knowledge representation: state-based representation, knowledge-based logical representations. Furthermore, they will master the resolution algorithms associated with these representations: search in graphs, heuristics, inference systems, learning based models.

Knowledge

Concepts

- Problems solving

- Uninformed exploration strategies.
- Informed exploration strategies
- Problems to satisfaction of constraints
- Exploration in adversity (games)
- Knowledge-based agents
- Representation of knowledge and inference.
- Expert systems.
- Learning
 - Supervised learning: decision trees, neural networks.
 - Unsupervised learning.

Know-how

- The course will allow students to dive into Python while solving AI problems and learning AI applications. Programming assignments will be in Python.

Teaching method

Class – Labs– Project.

Class Schedule

Week 1: Introduction to AI, history of AI, course logistics, and roadmap
 Week 2: Intelligent agents, informed and uninformed search. Problem solving
 Week 3: Heuristic search, greedy search, A* algorithm, stochastic search
 Week 4: Adversarial search, game playing
 Week 5: Constraint satisfaction problems, Knowledge Representation (expert systems, description logics, knowledge graphs, ontologies and fuzzy ontologies)
 Week 6: Machine Learning 1: basic concepts, linear models, K nearest neighbors, decision trees, overfitting, supervised and unsupervised learning
 Week 7: Machine Learning 2: neural networks, Markov decision processes, reinforcement learning. PyTorch Tutorial
 Week 8: Independent project work
 Week 9: Independent project work
 Week 10: Independent project work
 Week 11: Independent project work
 Week 12: Independent project work
 Week 13: Independent project work
 Week 14: Independent project work

Weeks 1-9 will be 1h Class Magistral (CM) + 2 Practical (TP)

Weeks 10-14 will be 3h TD (guided tutorials and project work)

Bibliography

[1] <https://courses.edx.org/courses/course-v1:ColumbiaX+CSMM.101x+2T2017/course/>